

Remarks

Claims 1, 2, and 4-31 are now pending in this application. Applicants have amended claims 1, 12, and 13 and cancelled claim 3 to clarify the claimed invention. Applicants respectfully request favorable reconsideration of this application.

Claim 1 now recites that the particles in of the filler of the polymeric matrix are any semiconducting material having an energy bandgap larger than 0 eV and smaller than 5 eV. As described at page 9, line 26, through page 10, line 9, the size and energy bandgap of the particles affects the properties of the particles, particularly with respect to the onset of non-linearity of resistance. The onset of the non-linearity of the resistance is the electric field strength at which the resistance changes from an essentially linear to an essentially non-linear behavior. As describes at page 10, lines 1-5, of the specification, onset of the non-linearity of the resistance increases with decreasing size of the particles. When the onset of the non-linearity of the resistance is at a higher field strength, reliable resistive field grading at high electric fields becomes possible.

Additionally, the nanoparticles according to the claimed invention result in percolation beginning at an essentially lower filler concentration as compared to the material including micro sized filler particles. This is described at page 3, lines 13-16, and page 7, lines 2-22, and shown in Fig. 2. The fact that a lower amount of particles can be used to achieve the field grading also results in a material with better mechanical properties is important. It is highly desirable in applications where the invention is exposed to mechanical loads. It is also an advantage that a

lower amount of particles needs to be handled and mixed with the polymeric matrix.

Additionally, Fig. 2 illustrates how the claimed invention provides superior electrical resistivity at lower filler concentration as a percentage of volume.

The Examiner rejected claims 1-12, 14-28, 30 and 31 under 35 U.S.C. § 102(b) as being anticipated by U.S. patent 6,228,904 to Yadev et al. The Examiner rejected claims 13 and 29 under 35 U.S.C. § 103(a) as being unpatentable over Yadev et al. in view of U.S. patent publication 2002/0070428 to Bernhoff et al.

Yadev et al. does not disclose the claimed invention since, among other things, Yadev et al. does not disclose a composite material for grading an electric field in high voltage applications. Additionally, Yadev et al. does not disclose a filler that includes a resistive and/or capacitive field grading effective amount of particles. Furthermore, Yadev et al. does not disclose particles that have an energy bandgap larger than 0 eV and smaller than 5 eV. Yadev et al. does not include any disclosure of how to obtain an increased electrical breakdown strength of a field grading material such that it can be used at high-voltage applications.

While Yadev et al. may disclose a large number of different nanoparticles in different types of matrices, such as a ceramic or a polymeric matrix, Yadev et al. only discloses one example of an electric device using a nanocomposite in Example 5. The nanocomposite in Example 5 includes a zinc oxide matrix with a nanofiller. In other words, Yadev et al. does not disclose a polymeric matrix as in the claimed invention.

Yadev et al. discloses in claim 16 a varistor device including a nanostructured filler and a filler loading in the composite material that are selected such that the voltage parameter  $\alpha$  for the varistor device is at least 20 percent greater than for a varistor device having a composite material of similar composition with filler particles having an average domain size of at least 1 micron. As shown in Fig. 5 of the present application,  $\alpha$ , or the slope of the curve, is lower for the field grading material with nano-sized particles as compared to a field grading material with micron particles. This is opposite to what Yadev et al. discloses in claim 16. Also, the matrix of the varistor material described in Example 5 of Yadev et al. is a ceramic.

Yadev et al. is mainly concerned with changes in resistivity of composite materials when using nano scale powder instead of a micron scale powder. Examples 1-3 of Yadev et al. gives three examples of nanocomposites with a polymeric matrix. None of these examples discloses a field grading material.

Additionally, none of the examples discloses the problem of or a solution to the problem of changes in resistivity of a composite material when using nano-scale powder instead of a micron scale powder. Most of the examples of Yadov et al. show that resistivity decreases when nanoparticles are used instead of micron particles. For example, in Example 1 the resistivity for 20 vol% nanoparticles of Indium Tin Oxide (ITO) in PMMA is  $1.75 \times 10^4$  ohm-cm, and the resistivity for 20 vol% micron scale ITO in PMMA was  $8 \times 10^8$  ohm-cm. This is opposite to the claimed invention. Along these lines, Applicants directed the Examiner's attention to Fig. 5.

In view of the above, Yadev et al. does not disclose all elements of the invention recited in

claims 1, 2, 4-12, 14-28, 30 and 31. Since Yadev et al. does not disclose all elements of the invention recited in claims 1, 2, 4-12, 14-28, 30 and 31, the invention recited in claims 1, 2, 4-12, 14-28, 30 and 31 is not properly rejected under 35 U.S.C. § 102(b). For an anticipation rejection under 35 U.S.C. § 102(b) no difference may exist between the claimed invention and the reference disclosure. *See Scripps Clinic and Research Foundation v. Genentech, Inc.*, 18 U.S.P.Q. 841 (C.A.F.C. 1984).

Along these lines, anticipation requires the disclosure, in a cited reference, of each and every recitation, as set forth in the claims. *See Hodosh v. Block Drug Co.*, 229 U.S.P.Q. 182 (Fed. Cir. 1986); *Titanium Metals Corp. v. Banner*, 227 U.S.P.Q. 773 (Fed. Cir. 1985); *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 1 U.S.P.Q.2d 1081 (Fed. Cir. 1986); and *Akzo N.V. v. U.S. International Trade Commissioner*, 1 U.S.P.Q.2d 1081 (Fed. Cir. 1986).

The combination of Yadev et al. and Bernhoff et al. does not suggest the invention recited in claims 13 and 29 since, among other things, Bernhoff et al. does not overcome the above discussed deficiencies of Yadev et al. For example, Bernhoff et al. does not suggest a composite material for grading an electric field in high voltage applications, a filler that includes a resistive and/or capacitive field grading effective amount of particles, particles that have an energy bandgap larger than 0 eV and smaller than 5 eV, or how to obtain an increased electrical breakdown strength of a field grading material such that the material can be used at high-voltage applications. The Examiner only cites Bernhoff et al. as suggesting particles made of certain materials. Even if Bernhoff et al. were to suggest particles made of the materials listed by the Examiner, Bernhoff et al. does not suggest the amount of particles or particles having the energy

bandgap recited in the claims.

Bernhoff et al. does not suggest nano-size particles in an embodiment that includes a polymeric field grading material and/or in a resistive and/or capacitive field grading effective amount. These differences between the invention and the combination of Yadev et al. and Bernhoff et al. result in materials having quite different properties and than the claimed invention. Accordingly, the combination of Yadev et al. and Bernhoff et al. does not suggest the invention recited in claims 13 and 29.

In view of the above, the references relied upon in the office action, whether considered alone or in combination, do not disclose or suggest patentable features of the claimed invention. Therefore, the references relied upon in the office action, whether considered alone or in combination, do not anticipate the claimed invention or make the claimed invention obvious. Accordingly, Applicants submit that the claimed invention is patentable over the cited references and respectfully request withdrawal of the rejections based on the cited references.

In conclusion, Applicants respectfully request favorable reconsideration of this application and issuance of the notice of allowance.

If an interview would advance the prosecution of this application, Applicants respectfully urge the Examiner to contact the undersigned at the telephone number listed below.

The undersigned authorizes the Commissioner to charge fee insufficiency and credit

overpayment associated with this communication to Deposit Account No. 22-0261.

Respectfully submitted,

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/Eric J. Franklin/  
Eric J. Franklin, Reg. No. 37,134  
Attorney for Applicants  
Venable LLP  
575 7<sup>th</sup> Street, NW  
Washington, DC 20004  
Telephone: 202-344-4936